Sea-Ice Cover

Product Description

Global sea-ice cover will be mapped daily and every 10 days at 1-km resolution using an algorithm called ICEMAP. Global sea-ice cover will be an at-launch MODIS product. Sea ice is present over approximately 13 percent of the Earth's ocean surface (Weeks, 1981). Snow-covered sea ice, with its high albedo, is a key parameter of the global energy balance, reflecting much of the incident solar radiation back to space. Additionally, the sea-ice cover is an insulating layer between the ocean and atmosphere; heat loss through open water is up to 100 times greater than heat loss through thick ice. As a consequence, leads and polynyas (linear and nonlinear openings in the sea ice, respectively) are significant to the energy budget of the ice-covered ocean and to local and regional climatology. Such open water areas and areas of reduced ice concentration are also important for shipping in ice-covered seas.

Research & Applications

Sea ice cover is currently mapped by NOAA visible and near-infrared sensors, and by microwave sensors, both passive and active. Using the NOAA sensors, snow/cloud discrimination is a major hindrance in identifying sea ice. The passive-microwave sensors map sea ice through cloud cover, but at a resolution of only about 30 km^2. Active microwave sensors have good spatial resolution, up to about 25 m^2, but currently do not map sea ice cover globally on a daily basis. MODIS will be able to map sea ice globally but with the significant limitation that cloud cover will obscure the view of the surface for much of the time. Together, the MODIS and microwave sensors will provide important information on the presence and concentration of sea ice. MODIS data, when available, will provide the higher resolution view of the sea ice that is not obtainable using passive-microwave data.

Data Set Evolution

ICEMAP has a considerable heritage. It is based on the normalized difference of a visible and a shortwave infrared band. This technique has been used to map snow from aircraft and satellites (Kyle, *et al.*, 1978; Dozier, 1984 and Hall, *et al.*, 1995) and has been shown to be effective for mapping sea ice as well. The 10-day composited sea ice cover product is designed to provide sea ice-cover persistence statistics for each pixel so that users can determine how long sea ice has been present during the previous 10 days in any given location. A cloud mask will be provided by another MODIS investigator.

Suggested Reading

Dozier, J., 1984.

Hall. D.K., *et al.*, 1995.

Kyle, H.L., *et al.*, 1978.

Weeks, W.F., 1981.

MOD 29, MOD 42
PRODUCT SUMMARY

Coverage:
global, daytime over nonequatorial ocean

Spatial/Temporal Characteristics:
1 km × 1 km daily (Level 2 MOD 29) and 1 km × 1 km weekly (Level 3 mapped MOD 42).

Key Geophysical Parameters:
sea ice extent

Processing Level:
2, 3

Product Type:
standard, at-launch

Science Team Contact:
D. Hall